

REMARKS

I. Drawing

The drawing figures were objected to because the figures 1 to 4 contained lines, numbers and letters that were not well defined according to the PTO-948 form. Formal drawings prepared by a patent draftsman will be filed at a later stage in the prosecution of this application. Abeyance of the requirement to provide formal drawings is respectfully requested.

II. Claim Changes

Radio station claims 29 to 30 are substantially unchanged, but minor wording changes have been made in dependent claim 30 to correct informalities and provide a somewhat clearer claim wording.

New claims 31 to 45 have been added. These claims replace canceled claims 14 to 28. The new claims 31 to 45 contain similar subject matter but have been drafted to more clearly define the claimed radio stations and methods from the newly cited prior art, especially the U.S. Patents of Antonio, et al, and Karlsson, et al.

More specifically, method claims 31 to 36 include subject matter from canceled method claims 14 to 19, but have been drafted so that they are more clearly distinguishable from the newly cited prior art.

Radio station claims 37 and 38 include subject matter from canceled

claims 20 and 21 respectively, but have been drafted so that they are more clearly distinguishable from the newly cited prior art.

Method claims 39 to 45 include subject matter from canceled claims 22 to 28, but have been drafted so that they are more clearly distinguishable from the newly cited prior art.

Some minor wording changes were made in claim 30 in order to provide a wording that is somewhat clearer and more definite.

III. Anticipation Rejection

Claims 21 to 23, 29 and 30 were rejected under 35 U.S.C. 102 (e) as anticipated by Antonio, et al, U.S. 6,519,456 B2 (referred to in the following as "Antonio").

New radio station claim 38 replaces canceled radio station claim 21. New method claims 39 and 40 replace canceled method claims 22 and 23 respectively. Radio station claims 29 and 30 are substantially unchanged, except for minor formal changes in claim 30.

Antonio, U.S. 6,519,456 B2, describes a CDMA telephone system, which generally includes a number of mobile stations and a number of base stations. Fig. 1 of Antonio does show a plurality of base stations 12 and mobile stations 10 communicating with each other over a plurality of channels, but each mobile station 10 is shown communicating with an individual base station via a single communication link indicated by a double arrow. Thus fig. 1 provides no

disclosure or even suggestion of a system in which a single base station includes means for transmitting signals over two or more separate channels to a single mobile station, or *vice versa*, as claimed in claims 29 and 38. Similarly fig. 1 provides no disclosure or suggestion of a CDMA system in which a single base station transmits signals over two or more separation channels to a single mobile station. The disclosure in column 5, line 5, and following of Antonio also never states or suggests that there are two separate channels used for sending signals from a single base station and a single mobile station.

Figs. 3, 5 and 6 and the associated disclosures in columns 5 and following of Antonio do not provide a basis for an anticipation rejection of a radio station or method of transmitting signals in which a single mobile radio station receives communications with a single base station via two or more separate channels. Fig. 3 of Antonio does show conventional architecture for a base station including a plurality of sector antennas 48 and RF receivers. Column 2, line 25, to line 34, explains that each sector antenna has directional receiving properties and handles communication in a particular direction from the base station. These directional antennas are for the purpose of increasing the capacity of the cell associated with the base station and do not provide means to receive signals over two or more channels from the same mobile station.

Furthermore in column 1, line 65, the secondary reference, Karlsson explains that the purpose of a conventional CDMA system is to allow multiple use of the same frequency band by multiple mobile units so that radio frequencies would not be clogged by use of too great a portion of the electromagnetic

spectrum (in contrast to FDMA). Signals from multiple mobile units are overlapped within the same frequency band by encoding the information on a coded signal generated by a code generator by means of a spreading code. In conventional CDMA system signals are transmitted from a single base station to a single mobile unit over a single communication channel (forward link).

The use of a single channel for transmission of signals from a base station to a single mobile unit in the prior art CDMA system provides benefits described in column 1, line 65 and following, of Antonio namely increased frequency reuse in the cellular system and soft handoff of a communication link with the mobile station from one base station to another base station. Antonio is especially concerned with the latter problem of providing a soft handoff. The invention of Antonio is an improved cellular telephone system that provides an improved soft handoff, which avoids call interruption and reduces dropped calls.

Thus one cannot conclude from the fact that a CDMA cellular system has a plurality of radio channels provided for transmissions between a base station and plural mobile stations, as described in Antonio, that a single base station transmits signals to a single mobile station via two or more channels.

There is no suggestion or disclosure of this critical feature of the applicants' claimed methods and claimed radio stations in the Antonio U.S. Patent. Applicants' radio station claim 38 requires the use of a modulator 4 including means for pre-equalization of radio signals to be transmitted to a (single) second radio station 2 (i.e. a single receiving or mobile station) and means for transmitting the pre-equalized signals over plural radio channels 20,25

to the second radio station 2. In other words, the single claimed radio station (base station) of claim 38 sends signals to the single mobile station via two or more radio channels. According to the understanding above regarding a CDMA system, the conventional CDMA system would not include such means because the CDMA system only uses a RF band to send signals from the base station to the mobile station.

Similarly Antonio cannot anticipate the method claimed in claim 39 (and thus dependent claim 40) because claim 39 includes the step of "transmitting pre-equalized signals from the plural antennas (50, 55) of the first radio station (1) over a plurality of radio channels (20,25) to the second radio station (2)".

This is the basic distinguishing feature of the invention because the use of plural radio channels for transmission in one direction from the base station to the mobile station, or *vice versa*, reduces fading incursions during calls and eliminates unwanted amplitude fluctuations during a communications link. These advantages are explained on pages 2 and 12 of the applicants' originally filed specification.

Additionally features, which were not in canceled claim 21, have been included in new radio station 38 so that claim 38 is clearly distinguished from Antonio and not anticipated by Antonio. These features include the means for performing an estimate of a total impulse response of the plural radio channels (20, 25) based on superimposed reference signals received over the plural radio channels from the second radio station. These features are similar to those of claim 20, which was not rejected as anticipated by Antonio.

New method claim 39 replaces canceled claim 22. New method claim 39 differs from canceled claim 22 by including three new method steps a), b) and c) that recite steps of the method explicitly. Previously steps a) and b) of claim 39 were found in the preamble of claim 22 creating some doubt regarding whether or not they were actually part of the claimed method. Now there is no uncertainty that these steps are indeed part of the claimed method.

Now claim 39 clearly claims a method in which a first radio station transmits pre-equalized signals to a second receiving radio station over a plurality of radio channels 20, 25. This of course has the advantages described above in connection with claim 38 and this feature is not disclosed or suggested by Antonio.

Radio station claims 29 and 30 also include the same distinguishing feature as claim 39, namely transmission of signals from a single first radio station to a single second radio station over a plurality of radio channels.

Antonio does mention a phase pre-equalization in column 12, line 16, and that an IIR digital filter can be used to provide it. However with respect to radio station claim 29 Antonio does not disclose or suggest that the phase pre-equalization considers the transmission properties of all the actually used radio channels and also all actually used codes (last two lines of claim 29). These latter features are not inherent in CDMA systems because conventional CDMA systems do not require two or more forward linking channels between a transmitting base station and a receiving mobile station. The features of claim 29 provide the advantage that both so-called inter-symbol interference between

transmitted data symbols of a radio station and also multiple access interference, i.e. interference by other radio stations, are considered, so that such interference requires no equalization in the receiving radio station.

It is well established that each and every limitation of a claimed invention must be disclosed in a single prior art reference in order to be able to reject the claimed invention under 35 U.S.C. 102 (b) based on the disclosures in the single prior art reference. See M.P.E.P. 2131 and also the opinion in *In re Bond*, 15 U.S.P.Q. 2nd 1566 (Fed. Cir. 1990).

Claims 37 to 39 and 29 and 30 are not anticipated because they are limited to means for or a method in which signals are transmitted from a single base station to a single receiving station over plural radio channels, and *vice versa*, which provides a system that reduces fading incursions – in comparison to the more conventional system. With respect to radio station claim 29 Antonio also does not disclose or suggest that the phase pre-equalization considers the transmission properties of all actually used radio channels and also all actually used codes. With respect to new radio station claim 38 Antonio also does not disclose means for performing an estimate of a total impulse response of the plural radio channels (20, 25) based on superimposed reference signals received over the plural radio channels from the second radio station.

For the foregoing reasons and because of the clarifying wording in the corresponding claims, it is respectfully submitted that new radio station claim 38 and method claims 39 and 40 should not be rejected under 35 U.S.C. 102 (e) as anticipated by Antonio.

Also withdrawal of the rejection of amended radio station claims 29 and 30 under 35 U.S.C. 102 (e) as anticipated by Antonio is respectfully requested.

III. Obviousness Rejections

Claims 14 to 15, 18, 20 and 25 were rejected under 35 U.S.C. 103 (a) as obvious over Antonio, et al, (referred to in the following as "Antonio") in view of Karlsson, et al (referred to in the following as "Karlsson").

Method claims 31, 32 and 35 replace canceled method claims 14, 15 and 18 respectively, and dependent method claim 42 replaces dependent method claim 25. Radio station claim 37 replaces canceled radio station claim 20. The newly filed claims include wording changes and/or additional limitations that further distinguish them from the prior art, especially Antonio and Karlsson.

Independent method claim 31 differs from the canceled independent method claim 14 by including two new method steps a) and b) that explicitly recite steps of the method. Previously the subject matter of steps a) and b) of claim 31 was found in the preamble of claim 14 creating some doubt regarding whether or not they were actually part of the claimed method. There is no uncertainty that these steps are indeed part of the claimed method of claim 31 and that the claimed method necessarily requires signal transmission from a single base station to a single mobile station (or vice versa) over plural (at least two) communication channels.

Claim 42 claims the same subject matter as canceled dependent claim 25, but claim 42 depends on independent method claim 39, which also includes the

above described critical distinguishing feature.

Neither Antonio nor Karlsson disclose or suggest transmitting signals from a single base station to a single mobile station via plural radio channels (forward links).

Antonio and the particular advantages of this important feature of applicants' claimed method, as in claims 31, 37 and 42 (via claim 39) , have been described above.

Karlsson does disclose a mobile station with plural antennas, which are thus capable of receiving radio signals over plural channels, and a plurality of signal processing branches for plural received signals (claim 12, fig.3). An antenna diversity method is employed and the plural received signals in the mobile station are weighted with weighting factors selected to maximize signal to noise ratio and RAKE reception. However Karlsson is generally silent regarding base station structure and detailed methods of base station transmission.

Furthermore Karlsson is limited to transmissions from plural base stations (two or more base stations of neighboring cells) received over plural radio channels at the single disclosed mobile station of Karlsson via the plural antennas of the mobile station. The primary aim of the invention of Karlsson is to suppress interfering signals received from interfering base stations when one base station is transmitting signals to a single mobile station (abstract; column 4, lines 4 to 10 and 30 to 35).

Thus Karlsson **does not** disclose or suggest a method of transmitting signals from a single base station to a single mobile station over a plurality of

channels or a method of receiving signals at a single mobile station from a single base station via plural radio channels. Also Karlsson does not disclose the advantages of such an arrangement, although Karlsson does disclose receiving signals at a single mobile station from plural base stations including one primary base station and one interfering base station.

None of the other sections of the Karlsson reference, which is largely silent regarding the base station, suggests receiving signals at a single mobile station from a single base station via plural radio channels. Fig. 2 and the associated disclosure in column 5, line 45 and following show a cell of a conventional CDMA system (it is labeled "Prior Art") in which there is a single base station receiving transmissions from separate mobile stations 1 to N (in accordance with the prior art). The structure of the individual mobile stations 1 to N is shown on the left in fig. 2. The reference does not state anywhere that the transmitters shown in fig. 2 are in a single mobile station. The subject matter of Karlsson is concerned with the receiving means present in the mobile station which is shown in fig. 3 according to column 5, line 65, to column 6, line 8. This receiving means can receive multiple signals from plural base stations including a desired signal and includes means for de-spreading or decoding the multiple signals and for suppressing all the interfering signals in order to extract the desired signal (see claim 1, claim 7, claim 13 and claim 14). Also Karlsson includes graphical illustrations showing the benefits of using multiple receiving channels to suppress interference from a single interfering base station (there also being a primary base station producing the desired signal) in fig. 5, which is

described in column 11, line 52 to column 12, line 9.

It is well established by many U. S. judicial decisions that to reject a claimed invention under 35 U.S.C. 103 there must be some hint or suggestion in the prior art of the modifications of the disclosure in a prior art reference or references used to reject the claimed invention, which are necessary to arrive at the claimed invention. See M.P.E.P. 2143. For example, the Court of Appeals for the Federal Circuit has said:

"Rather, to establish obviousness based on a combination of elements disclosed in the prior art, there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant...Even when obviousness is based on as single reference there must be a showing of a suggestion of motivation to modify the teachings of that reference.." *In re Kotzab*, 55 U.S.P.Q. 2nd 1313 (Fed. Cir. 2000). See also M.P.E.P. 2141

Karlsson does not provide a hint or suggestion of the key feature that is lacking in Antonio. Karlsson does not disclose or suggest a radio transmission system in which a single base station includes means for transmitting signals over two or more separate channels to a single mobile station, or *vice versa*, as claimed in new claim 37. Similarly Karlsson provides no disclosure or suggestion of a system in which a single base station transmits signals over two or more separate channels to a single mobile station, and vice versa, as claimed in new claim 31 and the claims dependent on it.

Also Zhuang provides not hint or suggestion of a system in which a single base station transmits signals over two or more separate channels to a single

mobile station, and vice versa, as claimed in new claim 31 and the claims dependent on it. Zhuang is cited for different reasons as seen from the Office Action and further explanations below.

Radio station claim 37 differs from radio station claim 20 by deletion of the "means for selecting" but addition of a means from transmitting weighted respective reference signals to another radio station (a single station) via the plural radio channels. Also the means for transmitting the weighted reference signals forms them by multiplying reference signals by corresponding coefficients c_1 , c_2 associated with the respective antennas and transmits them from the associated antennas.

Karlsson thus does not disclose or suggest transmitting reference signals from a mobile station to a second radio station (base station), in which the reference signals are weighted multiplicatively with an associated coefficient for each radio channel and wherein the signals received over the radio channels are weighted with the same coefficients. In this way a directional characteristic of the signals propagated from the antennae of the radio station or to be received can be realized, which can advantageously be provided to the second radio station. It can be guaranteed that the described directional effect and all the channels between both radio stations will be considered because of the weighting of the reference signals transmitted from the radio station.

Thus Karlsson does not disclose or suggest this sort of weighted transmission of reference signals. The same is true of the disclosures in Zhuang, which only describes the estimation of a channel impulse response based on

coefficients of a decision feedback equalizer (DFE). Thus radio station claim 37 is not obvious from a combination of Antonio and Karlsson with or without Zhuang.

Dependent method claims 16 to 17, 19 and 26 and 27 were rejected under 35 U.S.C.103 (a) as obvious over Antonio, in view of Karlsson, and further in view of Zhuang, et al.

Dependent method claims 24 and 28 were rejected under 35 U.S.C. 103 (a) as obvious over Antonio in view of Zhuang, et al.

New dependent method claims 33, 34 and 39 depend on independent method claim 31 and include the features of canceled claims 16, 17 and 19 respectively. These dependent claims should be allowed because they depend on an allowable method claim 31. In other words, additional features from these dependent claims are not currently being argued as additional reasons for allowance of those claims.

New dependent method claims 41, 43, 44 and 45 depend on independent method claim 39 and include the features of canceled claims 24, 26, 27 and 28 respectively. These dependent claims should be allowed because they depend on an allowable method claim 39. In other words, additional features from these dependent claims are not currently being argued as additional reasons for allowance of those claims.

Summarizing it is not enough that the prior art transmission system on which rejection is based has a mobile station with a receiver that has plural

antennas that receive signals over plural radio channels or that the transmission system includes plural radio channels or links and plural base stations and mobile stations to provide a justification of a rejection under 35 U.S.C. 103 (a). None of the prior art reference of record disclose or suggest a transmission system in which a single base station transmits signals over plural transmission channels to a single mobile station, and *vice versa*. This type of modified CDMA system has the advantage of reducing fading incursions. Some other distinguishing features for individual claims are mentioned in the REMARKS above.

For the foregoing reasons and because of the changes in claim wording, it is respectfully submitted that new claims 31 to 45 should not be rejected as obvious under 35 U.S.C. 103 (a) over Antonio in view of Karlsson, with or without Zhuang, et al.

IV. Additional Information Disclosure Statement

An additional Information Disclosure Statement with some additional prior art references accompanies this amendment.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such

amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549 4700.

In view of the foregoing, favorable allowance is respectfully solicited.

Respectfully submitted,



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